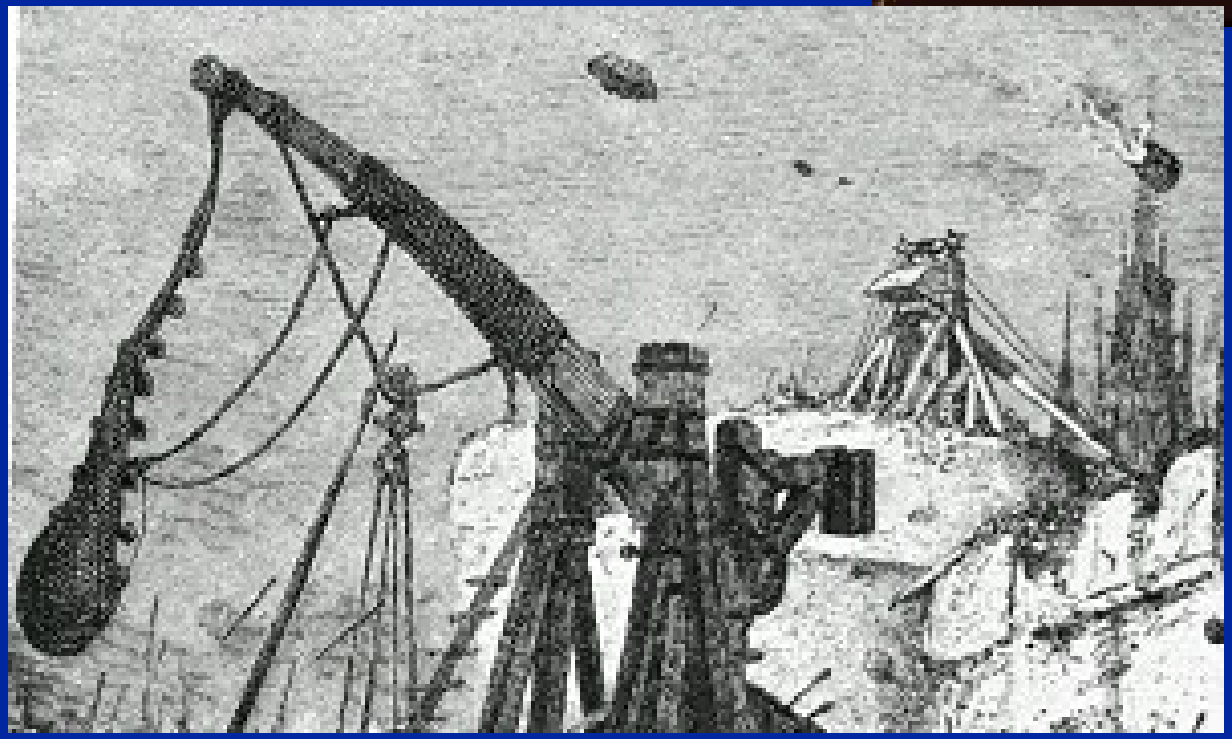
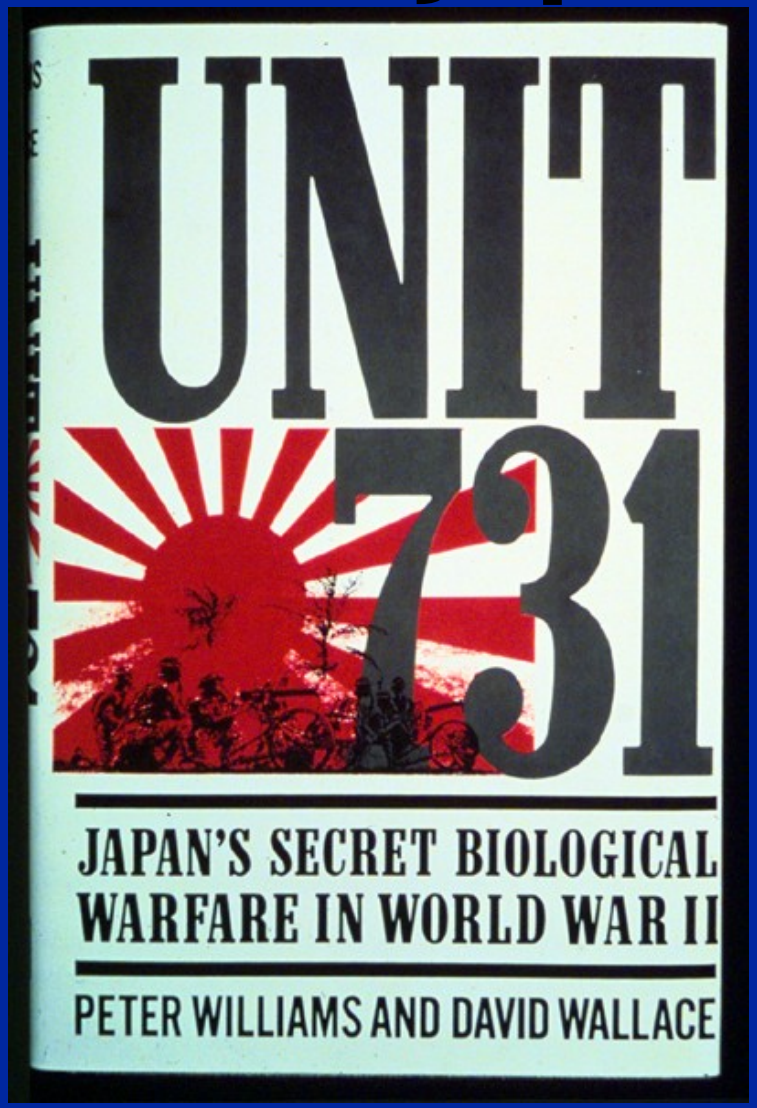
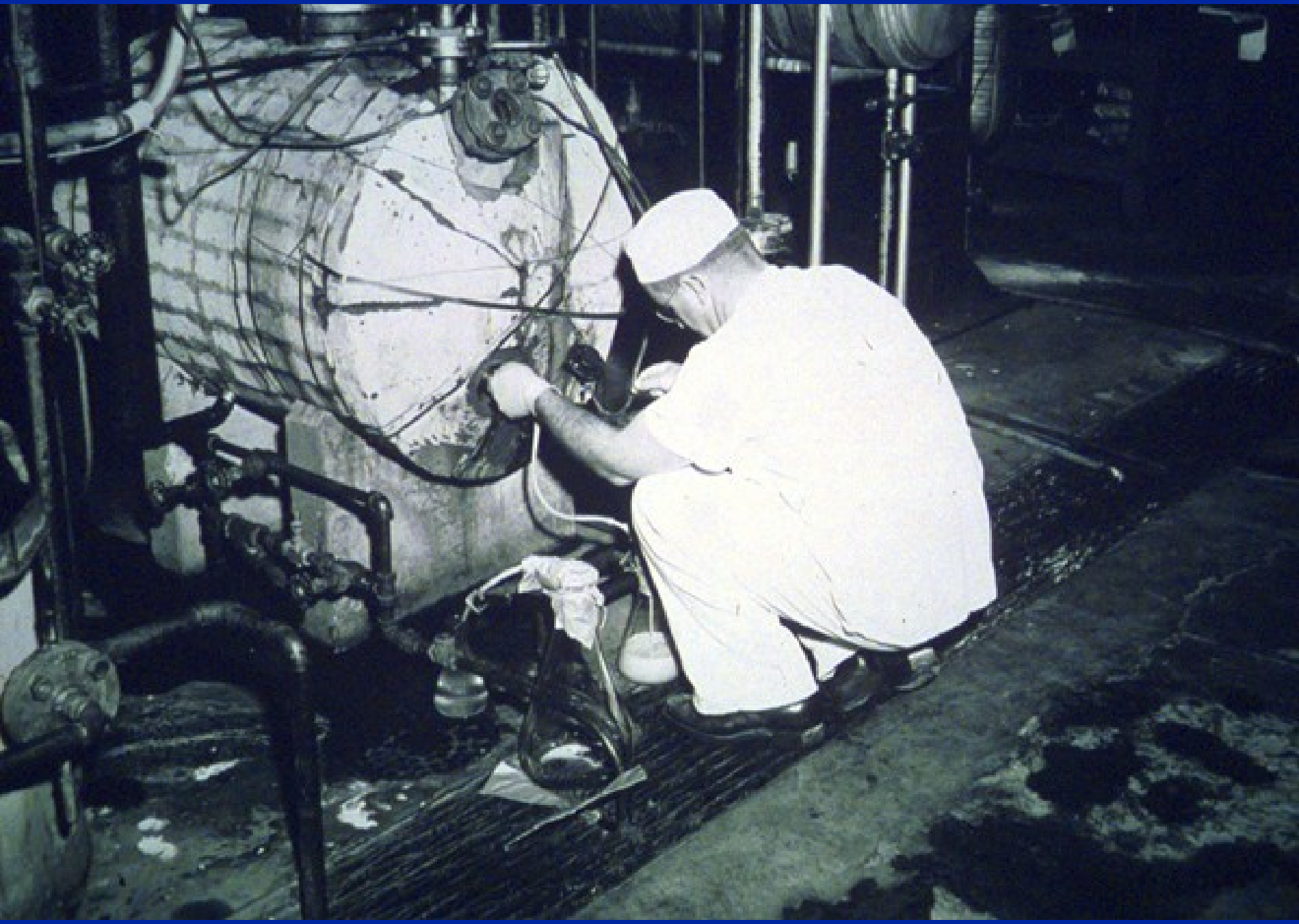
KAFFA

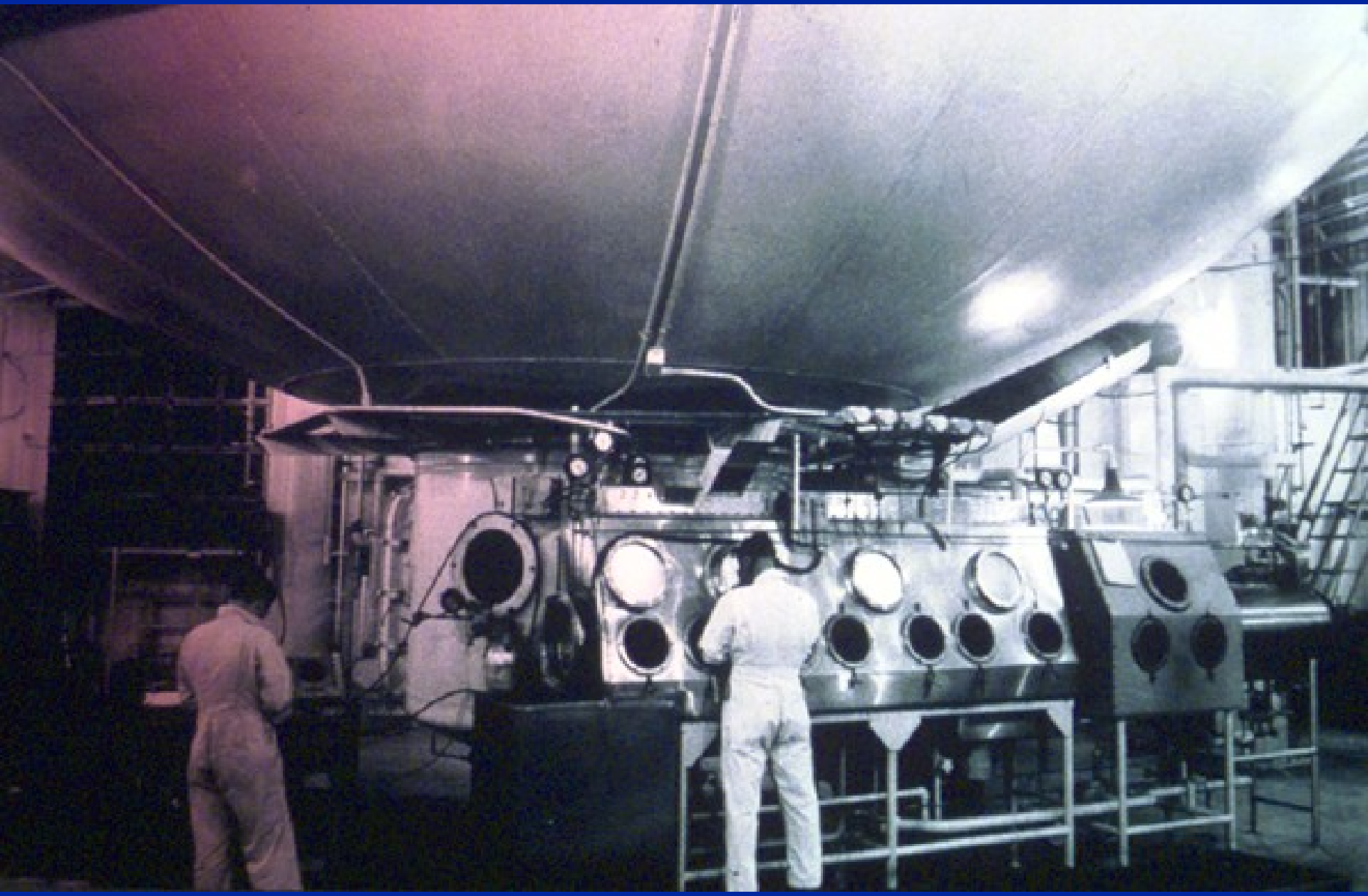


Japan: WW II



- **Unit 731**
  - Basic research
  - Alleged human experimentation
  - Alleged field trials in eleven Chinese cities
  - *Y. pestis, Shigella sp.*
  - Potential casualties among Japanese troops: Field trials terminated 1942, but basic research continued at Unit 731 until the end of the war.





US Program

- 1943: Offensive program begun
- 1953: Defensive program begun
- 1969: Offensive program terminated
- 1969-72: BW agents/munitions destroyed
- 1975: Ratified Geneva Protocol and BWC

1972 *Biological Weapons Convention*

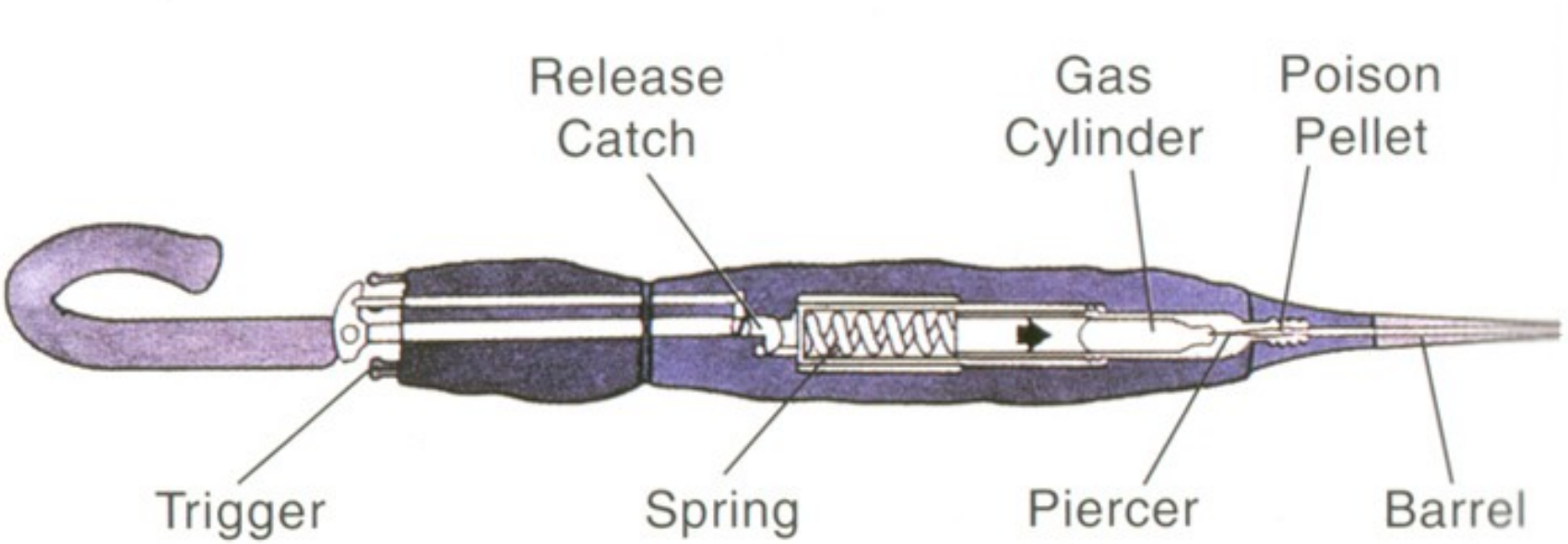
- **Parties agree:**
  - Never to develop, produce, stockpile, acquire or retain any biological agent for other than peaceful purposes
  - To facilitate exchange of equipment, materials, and information on use of biological agents for peaceful purposes
- **Problem:**
  - No mandatory measures for verification or enforcement

Termination of US Offensive BW Program

- **Offensive BW not essential for national security**
- **Unpredictable/Unreliable**
  - Weather conditions
  - Lack of empiric validation
- **Dangerous for user**
- **Field commanders and troops unfamiliar with use**

Destroyed US Biological Warfare Agents

- **Lethal:**
  - *Bacillus anthracis*
  - Botulinum
  - *Francisella tularensis*
- **Incapacitating**
  - *Brucella suis*
  - Venezuelan equine encephalitis virus
  - Staphylococcal enterotoxin B
  - *Coxiella burnetii* (Q fever)
- **Anti-Crop**
  - Wheat stem rust spores
  - Rye stem rust spores
  - Rice blast spores


Release
Catch
Gas
Cylinder
Poison
Pellet
Trigger
Spring
Piercer
Barrel

Offensive BW Program:USSR

- Continued after 1972 BWC
- Biopreparat
  - **Agency under ministry of defense**
  - **Up to 15,000 scientists and technicians**
  - **6 research labs**
  - **5 production facilities**
  - **Sverdlovsk accident: Anthrax spores**
- Program inherited by Russia
  - **1992: President Yeltsin promises to terminate program**
  - **No evidence that program has been terminated**
    - **Proceedings US Naval Institute1995;Feb:40-45**

Iraqi Disclosures: UNSCOM

- **Basic Research**
  - *B. anthracis, , rotavirus*, camel pox virus, botulinum, aflatoxin, mycotoxins, wheat cover rust
- **Production (L) Produced Weaponized**
  - Botulinum 19,000 10,000
  - Anthrax 8,500 6,500
  - Aflatoxin 2,200 1,580
  - UN Document S/1995/864, 11 October 1995

Iraqi Disclosures: UNSCOM

- **Bombs**
  - Botulinum 100
  - Anthrax 50
  - Aflatoxin 16
- **SCUD missile warheads**
  - Botulinum 13
  - Anthrax 10
  - Aflatoxin 2
  - UN Document S/1995/864, 11 October 1995

Iraqi BW Program: 2003

- **Highly compartmentalized network of scientists, laboratories and safehouses**
  - Equipment concealed from UN inspectors
- **Collection of reference strains at scientist's home (*C. botulinum*)**
- **Use of "dual use" technology to develop processes relevant to prohibited BW agents**
  - Fermentation
  - Drying
- **Research: Potential BW agents not reported to UN**
  - Congo Crimean hemorrhagic fever virus
  - *Brucella* sp.
  - Ricin
  - Aflatoxin

Iraq Survey Group report to US Congress: House and Senate Permanent Select Committees on Intelligence, House Cmte on Appropriations, Subcmte on Defense: 2 October 2003

(IRAQ SURVEY GROUP)

Acquisition of Etiologic Agents

- Field samples or clinical specimens
- Multiple culture collections
- Universities
- Commercial biologics supply houses
- Foreign laboratories
- Genetic engineering to enhance virulence

Easy to Produce: "Dual Use" Technology

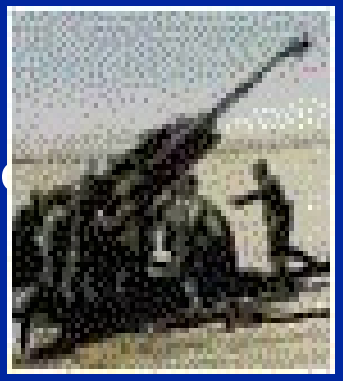
Low Cost

- **Costs of producing mass casualties per square kilometer by weapon type**
  - Conventional $2000
  - Nuclear 800
  - Nerve gas 600
  - Biological 1
    - **Chemical-Biological Expert Panel, UN, 1969**

Delivery System

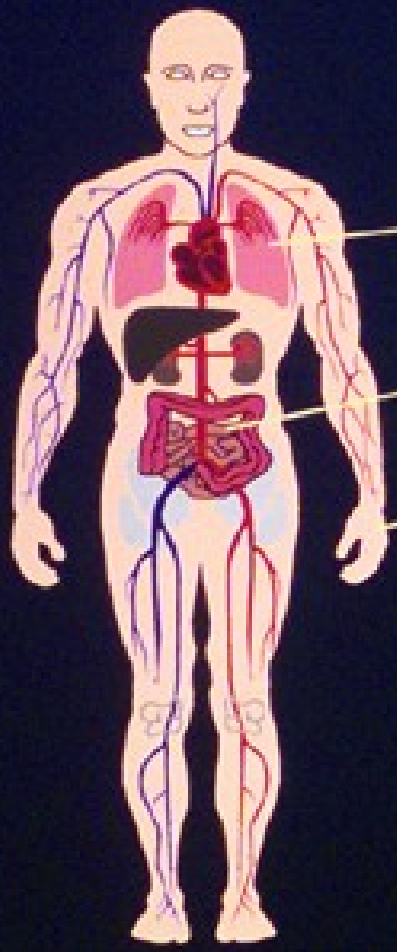
- Spray Tank: Optimal
  - **Generation of particles 1-5 microns**
    - **Settle in lower respiratory tract**
    - **Not detectable by our senses**
  - **Larger - mucocilliary clearance**
  - **Smaller – exhaled**
  - **Technically difficult-Large area coverage**
  - **Technically simple-Closed spaces October 2001**

- Exposive Munition: Poor delivery
  - **Heat, light from explosion inactivate ag**
  - **Inefficient production of particles of 1-5**



USAMRIID

PORTALS OF ENTRY OF BIOLOGICAL AGENTS



- RESPIRATORY TRACT (LUNGS)
- GASTROINTESTINAL TRACT
- SKIN AND/OR MUCOUS MEMBRANES

BW Agent Criteria

- **Easy to produce in industrial quantities**
- **Robust**
  - Survives storage in munition
  - Survives effects of aerosolization
  - Withstands desiccation, solar UV radiation
- **Infectious via inhalation**
- **High disease/infection ratio**
- **Vaccine/chemoprophylaxis/Rx to protect perpetrators**

Potential BW Agents*

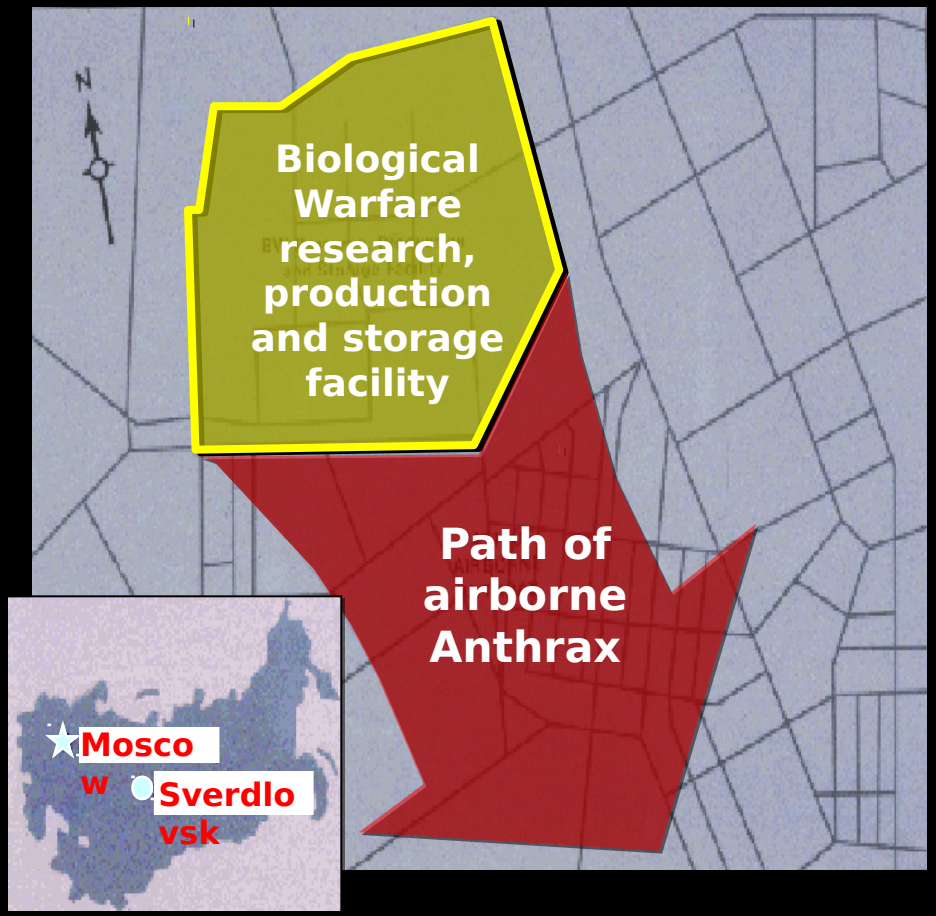
- **Bacterial**
  - **Anthrax**
  - **Brucellosis**
  - **Cholera**
  - **Meliodosis**
  - **Plague**
  - **Q fever**
  - **Tularemia**
    - **NATO AMedP-6(B)1996; Annex B unclassified**
    - **Not to be interpreted as sanctioned “threat list”**
- **Viral**
  - **Congo-Crimean HF**
  - **Rift Valley fever**
  - **Smallpox**
  - **VEE**
- **Toxins**
  - **Botulinum**
  - ***C. perfringens* toxins**
  - **Ricin**
  - **Saxitoxin**
  - **SEB**

Hypothetical Dissemination by Airplane of 50 kg of Agent Along a 2 km Line Upwind of a Population Center of 500,000*

Agent	Downwind Reach (km)	Cases	Deaths
Rift Valley Fever	1	35,000	400
Tick-borne enceph.	1	35,000	9,500
Typhus	5	85,000	19,000
Brucellosis	10	100,000	500
Q-fever	>20	125,000	150
Tularemia	>20	125,000	30,000
Anthrax	>>20	125,000	95,000

*Health Aspects of Chemical and Biological Weapons, WHO, 1970

Sverdlovsk Epidemic April 1979: Inhalation Anthrax



Meselson et al. *Science* 1994;266:1202-8

Decontamination

Personal Decontamination:

- Potentially contaminated cutaneous surfaces: soap and water
- heavily (grossly) contaminated cutaneous surfaces: wash with disinfectent or a 0.5% sodium hypochlorite solution and allow a contact time of 10-15 minutes

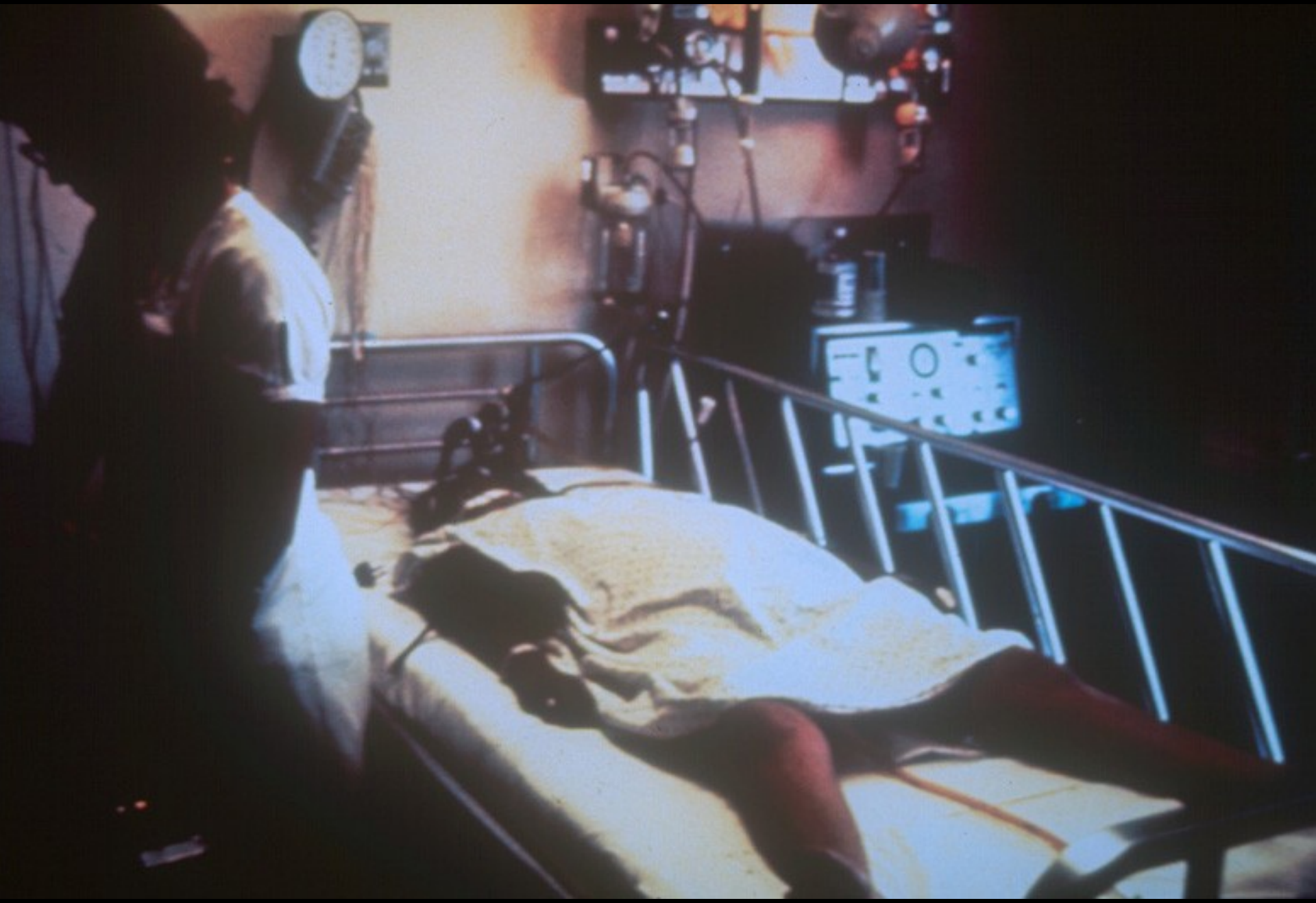
- **Environmental Decontamination**

ANTHRAX VACCINE
LOT FAV008
EXP 10 AUG 93
MICHIGAN DEPT. OF
SHAKE BEFORE
PENTAVALENT
Lot No. A 2
SHAKE BEFORE
NDC 49281-915-20 20 DOSES
YELLOW FEVER
VACCINE
YF-VAX®
CONNAUGHT®
A PASTEUR MÉRIEUX COMPANY
Code No. TSI-GSD 210
Western Equine Encephalitis
Vaccine Inactivated, Dried
CAUTION: New Drug Limited by
Federal Law to Investigational Use.
Government Services Division
THE SALK INSTITUTE
P.O. Box 250
Swiftwater, PA 18370 U.S.A.

MILES
CIPRO®
NSN 6505 99 899 3935
[POM]
[TO BE TAKEN

Agent Identificatio

- Integrated diagnostic testing
- CDC / DoD distributed reagents
- Public Health Laboratory Network



Psychological Dimensions

- **Psychological reaction to disaster**
  - Delerium
  - ASD and PTSD
  - Dissociation
  - Effects of medications
- **Unique psychological challenges**
- **Must meet high expectations of patient, family**
- **Protect from over-stimulation**
- **Key role of psychological evaluation in initial triage, treatment, long term care**

Hospital Infection Control Issues

- All Agents: Standard Precautions
- Plague: Respiratory Droplet
- Smallpox: Airborne + Contact
- VHF: Respiratory Droplet*

  Airborne*

  Contact*

  *Disease dependent

Role of Public Health Agencies

- Report cases of communicable diseases and possible BW attacks to public health agencies
- Epidemiologic assessment-naturally occurring epidemic vs BW attack
- Identification of population at risk
- Risk communication and postexposure prophylaxis

Logistics Strategy

- Logistics infrastructure to receive and distribute personnel and material
- Increased security and crowd control at critical facilities
- Plans for efficiently integrating local and central assets

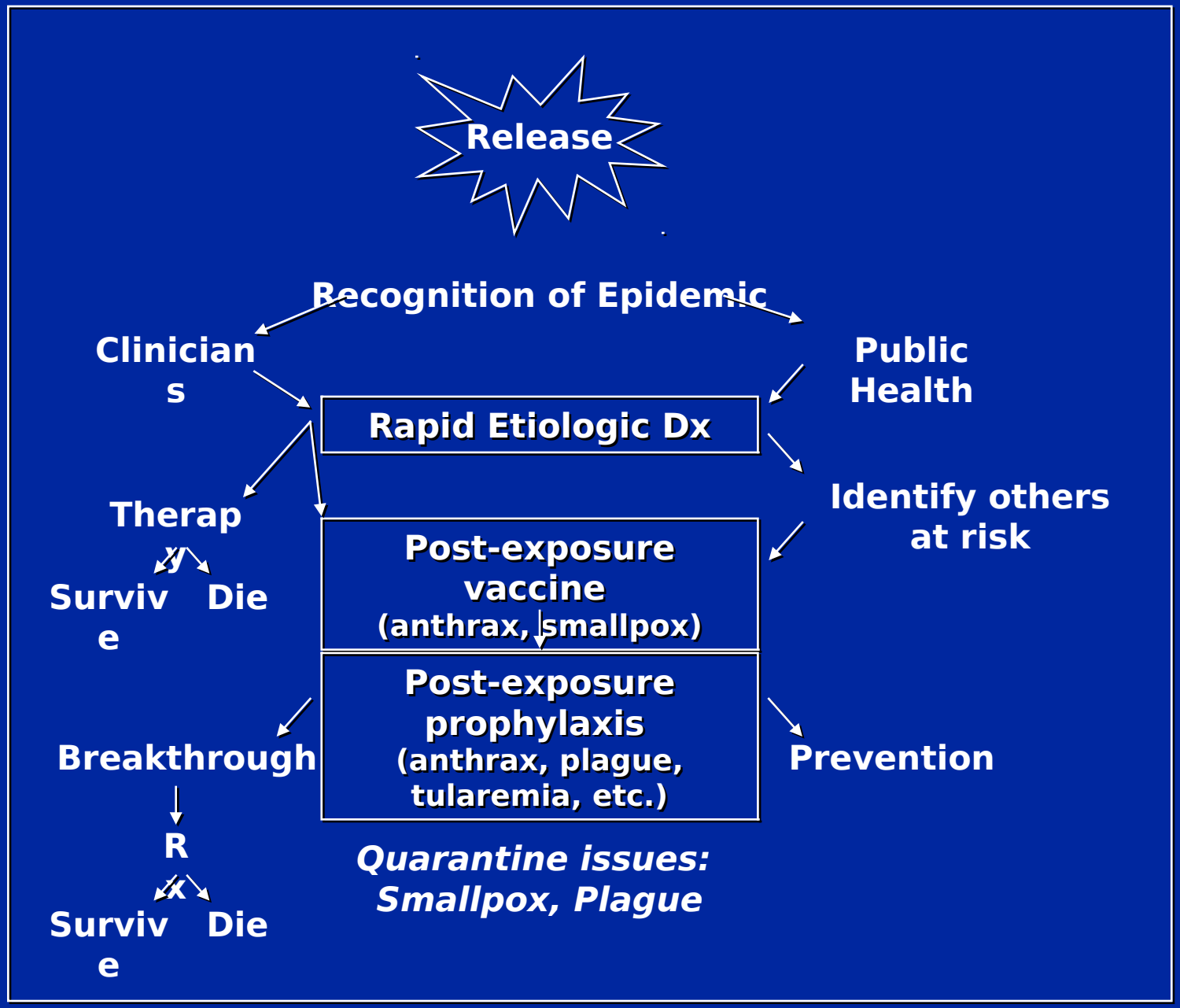
Casualty Management Strategy *Mass Care*

- Casualty Collection Points (CCPs)--Free standing medical facilities
- Internal Augmentation**--**Hospitals utilizing empty and decommissioned beds and large open spaces (cafeterias, meeting rooms)
- External Augmentation--OEM has assisted hospitals in locating Alternate Care Facilities
- Patient Relocation--Transporting patients to facilities outside the region.

BW Countermeasures

- MILITARY
- Environmental Detection
- Protective Equipment
- (Decontamination)
- Immunization
- Chemoprophylaxis
- Diagnosis
- Therapy
- Infection control
- Epidemiologic assessment

- CIVILIAN
- Diagnosis
- Therapy
- Infection control
- Epidemiologic assessment
- (Protective Equipment)
- (Decontamination)
- Chemoprophylaxis


Release
Recognition of Epidemic
Clinicians
Public Health
Rapid Etiologic Dx
Therapy
Survive
Die
Identify others at risk
Post-exposure vaccine
(anthrax, smallpox)
Post-exposure prophylaxis
(anthrax, plague, tularemia, etc.)
Breakthrough
Prevention
Rx
Survive
Die
Quarantine issues:
Smallpox, Plague